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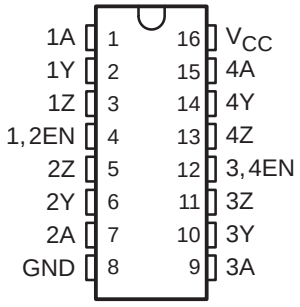
MC3487
QUADRUPLE DIFFERENTIAL LINE DRIVER

SLLS098A – MAY 1980 – REVISED MAY 1995

- **Meets or Exceeds Requirements of ANSI EIA/TIA-422-B and ITU Recommendation V.11**
- **3-State, TTL-Compatible Outputs**
- **Fast Transition Times**
- **High-Impedance Inputs**
- **Single 5-V Supply**
- **Power-Up and Power-Down Protection**
- **Designed to Be Interchangeable With Motorola MC3487**

D OR N PACKAGE
(TOP VIEW)



description

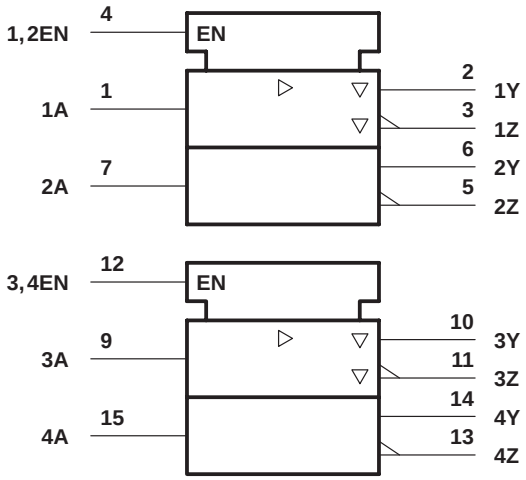
The MC3487 offers four independent differential line drivers designed to meet the specifications of ANSI EIA/TIA-422-B and ITU Recommendation V.11. Each driver has a TTL-compatible input buffered to reduce current and minimize loading.

The driver outputs utilize 3-state circuitry to provide high-impedance states at any pair of differential outputs when the appropriate output enable is at a low logic level. Internal circuitry is provided to ensure a high-impedance state at the differential outputs during power-up and power-down transition times provided the output enable is low. The outputs are capable of source or sink currents of 48 mA.

The MC3487 is designed for optimum performance when used with the MC3486 quadruple line receiver. It is supplied in a 16-pin dual-in-line package and operates from a single 5-V supply.

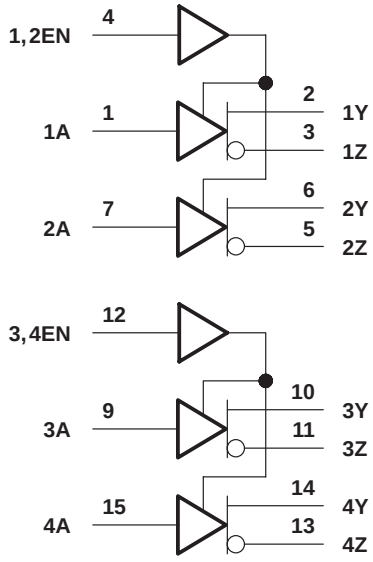
The MC3487 is characterized for operation from 0°C to 70°C.

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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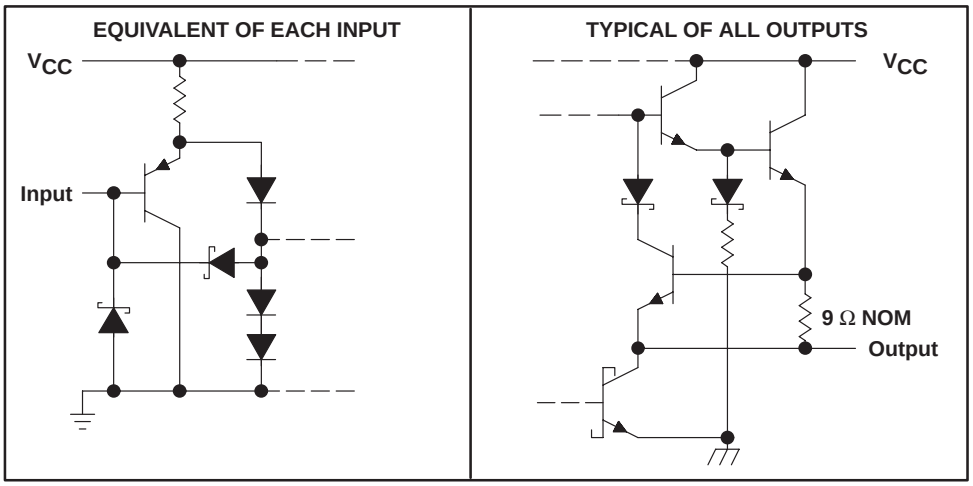
FUNCTION TABLE
(each driver)

INPUT	OUTPUT ENABLE	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

H = TTL high level, L = TTL low level,
X = irrelevant, Z = High impedance

schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} (see Note 1) . . . . . 8 V
Input voltage, V_I . . . . . 5.5 V
Output voltage, V_O . . . . . 7 V
Continuous total power dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . . . 0°C to 70°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values, except differential output voltage, V_{OD}, are with respect to the network ground terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW
N	1150 mW	9.2 mW/°C	736 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS			MIN	MAX	UNIT
V_{IK}	Input clamp voltage	I_I = –18 mA				–1.5	V
V_{OH}	High-level output voltage	V_{IL} = 0.8 V,	V_{IH} = 2 V,	I_{OH} = –20 mA	2.5		V
V_{OL}	Low-level output voltage	V_{IL} = 0.8 V,	V_{IH} = 2 V,	I_{OL} = 48 mA		0.5	V
$\lvert V_{OD}\rvert$	Differential output voltage	R_L = 100 Ω,	See Figure 1		2		
$\Delta\lvert V_{OD}\rvert$	Change in magnitude of differential output voltage†	R_L = 100 Ω,	See Figure 1			±0.4	V
V_{OC}	Common-mode output voltage‡	R_L = 100 Ω,	See Figure 1			3	V
$\Delta\lvert V_{OC}\rvert$	Change in magnitude of common-mode output voltage†	R_L = 100 Ω,	See Figure 1			±0.4	V
I_O	Output current with power off	V_{CC} = 0	V_O = 6 V			100	µA
			V_O = –0.25 V			–100	
I_{OZ}	High-impedance-state output current	Output enables at 0.8 V	V_O = 2.7 V			100	µA
			V_O = 0.5 V			–100	
I_I	Input current at maximum input voltage	V_I = 5.5 V				100	µA
I_{IH}	High-level input current	V_I = 2.7 V				50	µA
I_{IL}	Low-level input current	V_I = 0.5 V				–400	µA
I_{OS}	Short-circuit output current§	V_I = 2 V			–40	–140	mA
I_{CC}	Supply current (all drivers)	Outputs disabled				105	mA
		Outputs enabled,	No load			85	

† $\Delta\lvert V_{OD}\rvert$ and $\Delta\lvert V_{OC}\rvert$ are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.

‡ In ANSI Standard EIA/TIA-422-B, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS}.

§ Only one output at a time should be shorted, and duration of the short circuit should not exceed one second.

switching characteristics over recommended operating free-air temperature range , V_{CC} = 5 V

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 15 pF,	See Figure 2		20	ns
t_{PHL}	Propagation delay time, high- to low-level output				20	ns
	Skew time				6	ns
$t_{t(OD)}$	Differential-output transition time	C_L = 15 pF,	See Figure 3		20	ns
t_{PZH}	Output enable time to high level	C_L = 50 pF,	See Figure 4		30	ns
t_{PZL}	Output enable time to low level				30	ns
t_{PHZ}	Output disable time from high level				25	ns
t_{PLZ}	Output disable time from low level				30	ns

PARAMETER MEASUREMENT INFORMATION

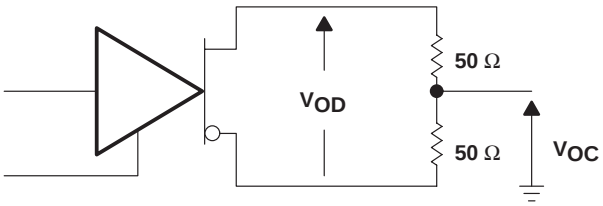
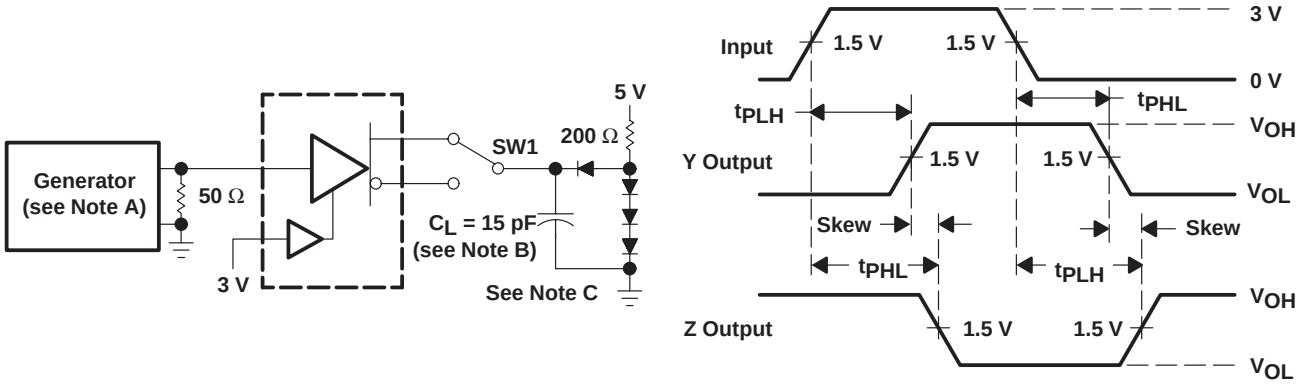
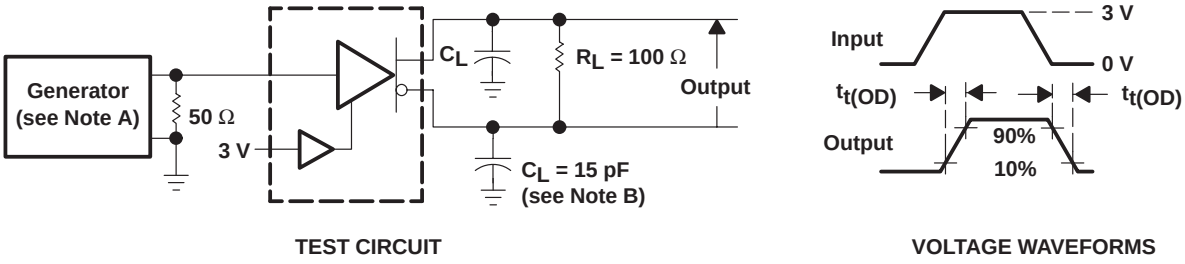


Figure 1. Differential and Common-Mode Output Voltages



NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_r \le 5$ ns, $t_f \le 5$ ns, PRR ≤ 1 MHz, duty cycle = 50%, $Z_O = 50\ \Omega$.
B. C_L includes probe and stray capacitance.
C. All diodes are 1N916 or 1N3064.

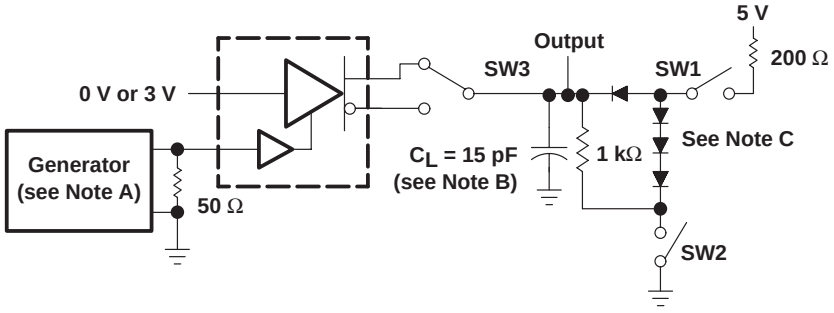
Figure 2. Test Circuit and Voltage Waveforms



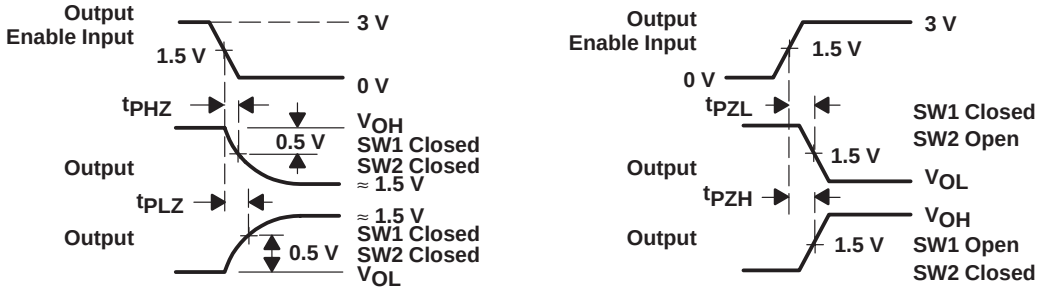
NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_r \le 5$ ns, $t_f \le 5$ ns, PRR ≤ 1 MHz, duty cycle = 50%, $Z_O = 50\ \Omega$.
B. C_L includes probe and stray capacitance.

Figure 3. Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_r \le 5$ ns, $t_f \le 5$ ns, PRR ≤ 1 MHz, duty cycle = 50%, $Z_O = 50\ \Omega$.
B. C_L includes probe and stray capacitance.
C. All diodes are 1N916 or 1N3064.

Figure 4. Driver Test Circuit and Voltage Waveforms

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